

CLAIMS

1. A gallium nitride-based semiconductor device having a p-type layer that is a gallium nitride compound semiconductor layer containing a p-type impurity and exhibiting p-type  
5 conduction, wherein the p-type layer comprises a top portion and an inner portion located under the top portion and wherein the inner portion contains the p-type impurity element and, in combination therewith, hydrogen.
2. A gallium nitride-based semiconductor device according  
10 to claim 1, wherein the p-type impurity is incorporated in the p-type layer by means of doping or ion injection.
3. A gallium nitride-based semiconductor device according to claim 1 or claim 2, wherein the inner portion of the p-type layer has a ratio of atomic concentration of the  
15 hydrogen to that of the p-type impurity of about 1:1.
4. A gallium nitride-based semiconductor device according to claim 1 or claim 3, wherein the inner portion of the p-type layer has a percent thickness of 40% to 99.9% with respect to a total thickness of the p-type layer.
- 20 5. A gallium nitride-based semiconductor device according to claim 4, wherein the inner portion of the p-type layer has a percent thickness of 70% or more with respect to the total thickness of the p-type layer.
- 25 6. A gallium nitride-based semiconductor device according to any one of claims 1 to 5, wherein the top portion of the p-type layer has a hydrogen content that is  $1/3$  or less the amount of the hydrogen contained in the inner portion.

7. A gallium nitride-based semiconductor device according to any one of claims 1 to 5, wherein the top portion of the p-type layer has a hydrogen content that is  $1/2$  or less the amount of the hydrogen contained in the inner portion.

5 8. A gallium nitride-based semiconductor device according to any one of claims 1 to 5, wherein the top portion of the p-type layer has a hydrogen content that is  $2/3$  or less the amount of the hydrogen contained in the inner portion.

10 9. A gallium nitride-based semiconductor device according to any one of claims 1 to 5, wherein the top portion of the p-type layer has a hydrogen content that is less than the amount of the hydrogen contained in the inner portion.